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TECHNIQUES OF FODDER PRODUCTION IN THE USSR

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Techniques of Fodder Production
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INTRODUCTION

USSR agricultural production has a significant impact on world food supply and marketing. Project [] has developed a system for predicting Soviet spring wheat production. The [] system uses modeling, meteorology, collateral, [] to produce the estimates. During the research phase, it became apparent that the [] analysts can improve their analysis if they understand the whole of Soviet crop agriculture, rather than just those processes involving spring wheat.

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This report provides information on Soviet fodder production. Two aspects of fodder production may be related directly to wheat production and utilization. Since hay is one of the first crops harvested during a growing season, it can provide early indications of general crop stress. Secondly, fodder is used to feed the growing livestock herds in the USSR. Fodder crop failure would require that more wheat be either diverted to fodder or used as feed grain.

SUMMARY

Approximately 30 percent of the sown area in the USSR is devoted to fodder crops. Fodder production has an impact on the Soviet goal to increase the amount of animal protein in its people's diet. A poor fodder crop, poor fodder harvesting techniques, spoilage of stored fodder, or improper fodder feed mix, all serve to limit the quantity and quality of Soviet livestock.

The main categories of fodder include hay, haylage, grass meal, silage, and food industry by-products. Fodder crops include perennial grasses, annual grasses, cereal grains, corn, sunflowers, fodder beets, and melons.

Fodder crops may be planted in the fall, as are winter cereal grains, or in the spring, as corn and sunflowers are. In the southern part of the country, many annual grasses are planted as a catch crop following the winter grain harvest. Mid-season care may include irrigation, fertilization, and insecticide application.

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The Soviets planned to produce more than 60 million tons of hay in 1974. Hay is grass which is normally mowed, sundried, gathered, transported, and stored in haystacks, towers, or haylofts.

During the peak haying period of mid-June, it may be possible to predict potential cereal-grain yields for a given area by measuring hay yields at that time.

Haylage is grass which is cut, chopped green, and stored in sealed silos at a moisture content usually below 50 percent. Storage requirements for silage are less stringent than for haylage since silage will produce lactic acid, a natural preservative. Haylage, however, must be sealed and protected from the outside environment if long-term storage is to be achieved with minimum spoilage.

Grass meal is a high-protein animal food derived from complete removal of moisture from the green matter by artificial dehydration. After the green matter is dehydrated into a flour, it may be either bagged or further processed in granulators with other feed additives to form a monofeed.

Silage, like haylage, is green matter which is cut, chopped green, and stored in sealed silos usually with a moisture content above 50 percent. It is protected from spoilage by the formation of lactic acid. Cereal-grain straw may also be made into silage.

Other fodder materials include many waste products from field crop harvesting and from the food processing industries. Tops, stems, and leaves of sugar beets, sunflowers, grain corn, cereal-grain straw, and vegetable crops are the most important.

Grain-fed animals are high in productivity and food quality; because of the Soviet efforts to increase livestock production, the trend is to increase the amount of feed grains and to decrease the importance of fodder. They intend to accomplish these goals by increasing the area sown to feed grains (barley, oats, and wheat), by decreasing the area sown to fodder crops while increasing the yield per hectare, by increasing fodder quality through the application of modern technology, and by increasing the utilization and management of natural meadows and grazing land.

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GENERAL

1. The major fodder crops in the Soviet Union include all crops, whether sown or uncultivated, which are harvested for hay, haylage, grass meal, or silage. Fodder crops include perennial grasses, annual grasses, cereal grains, corn, sunflowers, fodder beets, and melons. Altogether, there are approximately 3,000 different types of fodder used in the Soviet Union today.

2. In 1973, of the total 215 million hectares that were sown in the USSR, 63.4 million hectares, or 29 percent, were sown to fodder crops.¹ Of this, about 36 percent was sown to perennial grasses, 27 percent of annual grasses and winter grain (for fodder), 27 percent to corn and other silage crops, and 3 percent to other forage crops (roots, melons, etc.). Soviet figures do not account for the remaining 7 percent.

3. In addition to crops sown for fodder, the USSR has vast areas of meadow and grazing land totaling some 300 million hectares. Nearly 50 million hectares of this land is mowed for hay annually.²

SOURCES OF FODDER

<u>Grasses</u>	<u>Grains</u>	<u>Legumes</u>	<u>Other</u>
Fescue	Barley	Peas	Sugar beets
Sudan	Wheat	Beans	Potatoes
Orchard	Oats	Soybeans	Melons
Wheat	Rye	Vetch	Vegetables
Brome	Corn	Bird's foot trefoil	
Bent	Sunflowers	Alfalfa	
Timothy			
Canary			
Couch			

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Feather

Miliet

Sorghum

Clover

4. Since the Khrushchev regime, Soviet agricultural philosophy has attempted to respond more and more to the wishes of the Russian consumer. Wheat and livestock production in the USSR has risen dramatically as the Soviet people demand more and more white bread and meat products. Correspondingly, the production of animal feeds and wheat has had to increase appreciably to provide for the growing requirements. Although the total fodder crop area and production are declining, a good fodder harvest and improved storage of the crop remains necessary for sustaining the animal herds during the winter stall period, which lasts from November through April throughout most of the Soviet Union. As a hedge against poor crop years, many kolkhozes and sovkhozes try to maintain a $1\frac{1}{2}$ - 2 years' supply of fodder.

5. The 1974 Soviet, fodder production plans call for more than 60 million tons of hay, nearly 60 million tons of haylage, 3 million tons of grass meal, more than 20 million tons of silage, and about 50 million tons of root crops.³

FODDER CROPS⁴

Perennial Grasses (1971) - Area 21,725,000 hectares (ha)

	Percent of Total	Area
Clover -	45.8%	9,950,050 ha
Alfalfa -	22.9%	4,975,025 ha
Wheat grass -	10.1%	2,194,225 ha
Quack grass -	6.6%	1,433,850 ha
Sainfoin -	4.8%	1,042,800 ha

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Brome grass	- 4.1%	890,725 ha
Timothy	- 3.9%	847,275 ha
Other	- 1.8%	391,050 ha

Annual Grasses (1971) - Area 17,959,000 hectares

Percent
of Total

Annual grass	- 32.1%	5,764,839 ha
Corn for silage	- 25.1%	4,507,790 ha
Winter crops for green fodder	- 19.2%	3,448,128 ha
Vetch and vetch mixes	- 9.4%	1,688,146 ha
Sudan grass	- 8.8%	1,580,392 ha
Foxtail millet	- 4.2%	754,278 ha
Other	- 1.2%	215,508 ha

Planting and Mid-Season Care

6. A significant percentage of the fall-planted winter cereal grains, mainly rye and wheat, are planted specifically for use as fodder. Perennial forage grasses and legumes usually are overseeded on cereal fields in very early spring. At lower latitudes (in lower Ukraine) perennial forages also may be sown alone in late summer following early-harvested small grains. Annual forage grasses are planted in early spring using either the standard, grain seed drills or special grass drills. Corn, sudan grass, and millet for silage are planted in spring after the danger of frost. Both silage crops and annual grasses may be planted as a catch crop in the southern part of the country following the harvest of winter grains.

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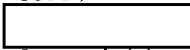
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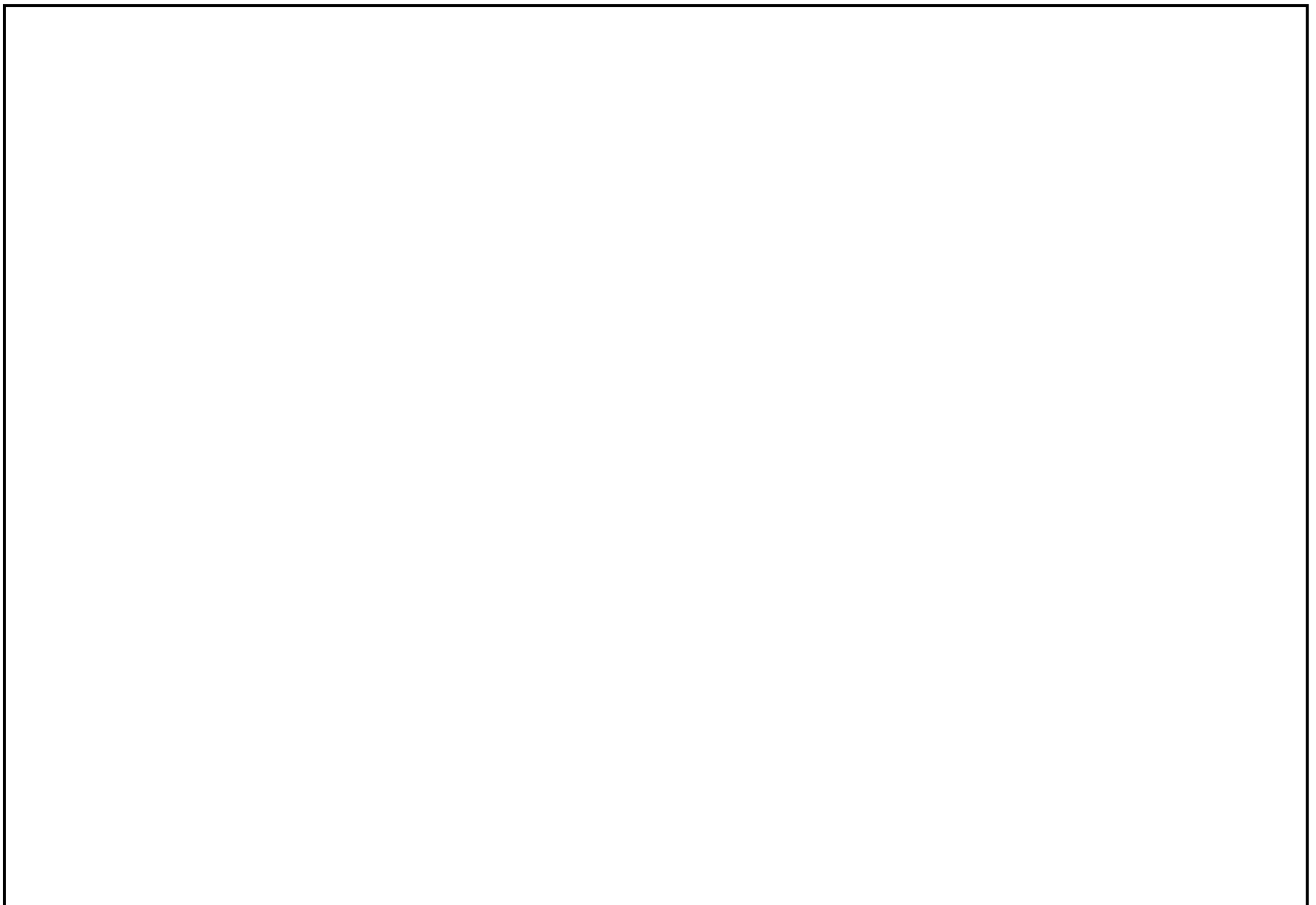
7. Mid-season care may include irrigation, fertilization, and insecticide application. Irrigation methods include sheet irrigation, central-pivot sprinklers, boom sprinklers, flexible hose sprinklers, and wide-radius sprinklers.  Fertilizers include manure and various mineral fertilizers. Insecticides are applied on a basis of need and availability.

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Hay

8. Hay crops are grasses which are normally mowed, sundried, gathered, transported, and stored in either open haystacks, or in haylofts. Hay is harvested throughout the country, either from sown fields or from natural growth in uncultivated areas. Uncultivated areas include areas adjacent to airfield runways, along roadways and electric powerline right-of-ways, along stream banks and drainage draws, in low wet spots in cultivated fields, and on military posts.

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[REDACTED]

9. Hay is harvested from mid-June through September with the peak first cutting occurring from 15-20 June in the south and southeastern parts of the country, up to mid-July in the north. Generally, two or more cuttings may be accomplished. Several cuttings, up to five or six for clover and alfalfa, may be made on irrigated fields.

10. Hay is first cut and left in the field for a few hours to several days for drying. Leaving the cut hay too long results in overdrying or risk of rain with a loss of valuable nutrients.

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11. Most of the hay is mowed with a single, tractor-mounted, cutting bar. [REDACTED] Some hay is cut with a tractor-drawn machine consisting of three, offset cutting bars with an attached hayrake. There is also a second type of tractor-drawn machine which cuts and rakes the hay in one operation. The hay also may be cut and windrowed by both the conventional, cereal-grain, swathing machine or a grain combine with special swathing head attachment. In hard to get places, the haying operation is done by hand, using the cutting scythe and pitchfork [REDACTED] After mowed hay has dried, it is windrowed using either a double-side delivery rake or a hay drop rake [REDACTED]

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12. After the hay has been windrowed, it is usually collected by a hay pickup and stacking machine which collects and stacks the hay in small circular stacks along the previous windrow. A trailer pickup hay baler, such as the PSB-1.6, may also be used [REDACTED] This baler picks up the windrowed hay and forms it into small, rectangular, pressed bales tied with wire. The stacks and bales are later lifted onto hay wagons or trucks by a tractor-mounted, front-fork loader and hauled to an area usually adjacent to the animal pens where it is either stored in large rectangular haystacks or in haylofts. A direct pickup-loader may also be used on the windrowed hay. This machine picks up and loads the loose hay directly onto a truck or wagon.

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14. On occasion, the hay is not allowed to fully dry in the fields. This hay is dried by a method known as "active" ventilation which may result in 1.5 times more nutrients than hay dried entirely by the sun. The mowed hay is allowed to dry to 40 percent moisture content in the field; then for final drying, the hay is artificially dried with warm forced air. This artificial drying takes place in the storage area. Baled hay may also be subjected to active ventilation.

15. An alternate method of storing hay is in the besstennaya tower. This tower is 30 meters high and consists of an inner cap which is lifted or lowered, depending on the level of hay within the tower. There is also an inner hollow shaft for ventilation. The hay is cut and partially dried in the field to 35-40 percent moisture. It is then gathered, chopped, and loaded into the tower where the active ventilation system dries it to the desired moisture content.

Haylage

16. Haylage is grass which is cut and chopped green, dried to below 50 percent moisture content, and then stored in sealed vertical silos or in covered trenches. The moisture content is not high enough for formation of lactic acid, as is the case for silage.

17. Haylage is harvested throughout the country. In recent years, this form of animal feed has become increasingly important. The cutting period for haylage is generally the same as for hay with middle-to-late June being the optimum.

18. Haylage differs from hay in that the cut green matter is not allowed to dry completely in the field. Most haylage is obtained from cereal grasses, clover, and alfalfa. Cereal grasses are cut at the heading stage of the panicles. Clover and alfalfa are cut at the budding stage at the start of flowering. The green matter is usually cut with the E-280 ensilage harvester and later chopped into small pieces with a chopper/mincer machine. The green matter may be cut and chopped at the same time with a YE-065, YE-067, or a KS-1.8 silage combine

These machines cut the crop from the field, chop it into small pieces, and blow it into a screened trailer. The trailer is towed to the area of the stockyard where the green-chop is stored in belowground trenches, above-ground ricks, or in haylage towers.

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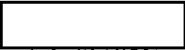
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19. The desired moisture content of the haylage is 45-50 percent for cereal grasses and 50-60 percent for leguminous forages. Filling the haylage trench should be completed as soon as possible (three to four days) so that spoiling and internal heating do not have time to begin. As soon as the trench is filled, the haylage is covered with a 20-30 cm thick layer of freshly mowed ground, well-packed moist grass for insulation, a layer of polyethylene film, 10-15 cm of soil. Finally, a half meter of straw is placed over the whole mass

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 Insulated from oxygen of the air, the haylage nutrients do not deteriorate. A kilogram of good haylage contains 50-60 grams of digestible protein and 30-40 milligrams of carotene. Haylage may also be stored in vertical, sealed silo towers similar to hay towers but having no ventilation system. Advantages of tower silo storage are ease of access to and distribution of the food material.

20. An alternate method of storing haylage, when silo trenches and towers are not available, is in aboveground ricks (surface trenches) enclosed with sideboards and covered with earth or other material. Surface trenches

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are built only in localities with a very high ground-water level. This method is not advisable in other areas because the material does not receive the insulation provided by trenches or towers; deterioration of the nutrients is likely.

Silage

21. Silage is cut green, chopped, and stored in belowground trenches or tower silos. Silage differs from haylage mainly in the type of crop and the moisture content of the stored material. The moisture content for silage should be 65-67 percent.

22. Corn is an important silage crop in the Ukrainian SSR and the northern latitudes. Sunflowers and soybeans are intercropped with corn in the Crimea for silage. Sunflowers and sorghum are important in Siberia. Forty-four percent of the silage in Omsk oblast is composed of sunflowers.

23. The silage crop is cut and chopped in the field using a YE-065, YE-057, or KS-1.8 silage combine. The chopped material is blown into a screened trailer which is then towed to a prepared silage trench. The silage trench is filled and covered with a polyethylene film and 30-40 cm of dirt. The silage is protected from spoilage by accumulation of lactic acid formed during early stages of silage fermentation. Temperatures between 25° and 35°C are most favorable for this fermentation.

24. Occasionally, straw or other haulm is mixed with the silage. Alfalfa and peas added to corn silage increase the protein of the silage by 100 percent.

25. Cereal-grain straw with a 50 percent moisture content may be made into silage by packing the straw in trenches and covering with earth 30-40 cm thick. Adding whey and carbamide increases the protein of the straw silage by 25 percent.

Grass Meal

26. Grass meal is a high-protein animal food derived from field crops dried artificially. The green material is fed into an AVM-0.4 or SB-1.5, grass meal, drying unit which dries it into a flour, which is bagged or processed in granulators along with grain, vitamins, minerals, and other feed additives to form a monofeed. Many grass meal operations are collocated with feed mix plants

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Other Fodder Materials

27. Refuse from field crop harvesting and processing may also be used as fodder. Waste products from sugar beets, sunflowers, grain corn, cereal grain, and vegetable crops are the most important. Threshed sunflower heads contain 1.5 times more digestible protein than corn grain. It can be made into meal or as a component of silage. Beet and potato tops, stems and leaves from vegetables and melon crops make very valuable meal and silage. Twelve to 15 tons of tops may be obtained from a single hectare of sugar beets.

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28. In some areas barley and millet straw are baled with pickup balers and fed directly to animals. Wheat straw, however, is not as nutritious and not normally baled. It is usually collected and stacked for use as bulk feed to supplement concentrated monofeeds. Wheat straw contains only 38 percent of the food value of an equal unit weight of barley straw.

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Trends in Soviet Fodder Production

29. Although the Soviets plan to increase the size and quality of their animal herds, total USSR fodder requirements are decreasing; there is an effort to decrease the number of hectares of arable land sown to fodder crops. The increases in livestock feed requirements are expected to come from the following: expanded use of feed grains (barley, oats, and wheat); raising the yield per hectare of sown fodder crops; improving the quality of fodder through the application of modern technology in procurement, processing, and storage; and better utilization and management of natural meadow and grazing land.

30. Feed grain cultivation is expanding rapidly to provide for greater livestock feed requirements. The 1974-75 projected feed use of grain is 108 million metric tons. Barley is the primary feed grain produced in the USSR today. Fifty-five million tons were produced for feed in 1973. An additional 32 million tons of wheat⁵ and 17.5 million tons of oats⁶ are harvested for feed grains annually.

31. The Soviets are increasing the use of irrigation and applications of both mineral and organic fertilizers to raise the yield per hectare of fodder crops. Research and development for better strains of seed continues; advanced methods of fodder harvesting, processing, and storage are recommended to farmers. Deviations from accepted fodder procurement methods are pointed out quickly in Soviet newspapers.

32. Emphasis is shifting from hay to haylage and vitaminized grass meal because of their higher food value; the use of forced-ventilation hay-driers is growing and deliveries of other modern equipment are increasing.

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